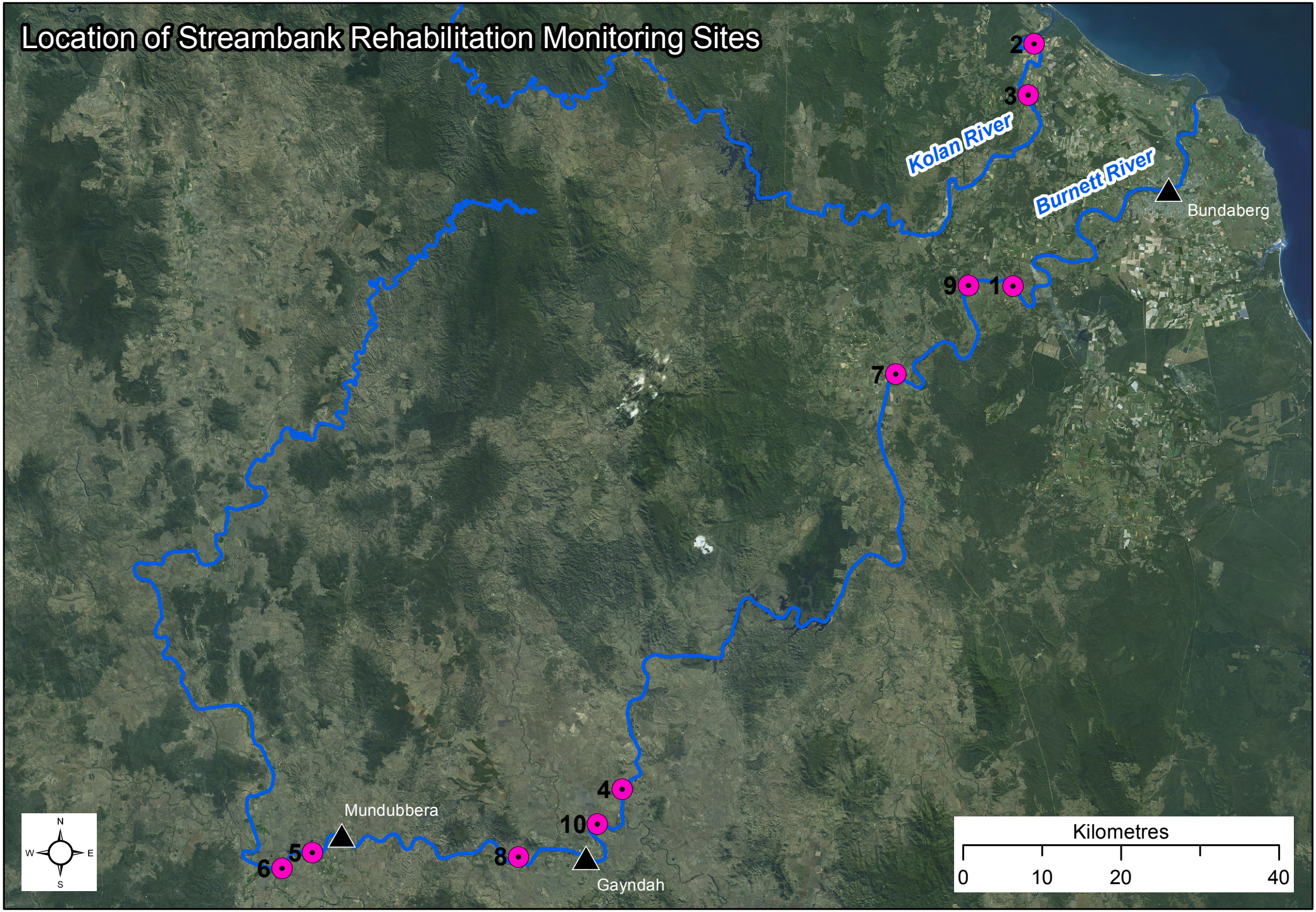
Streambank erosion baseline establishment project

Burnett & Kolan Rivers 2015

Appendix A

Map showing location of all sites


Location of Streambank Rehabilitation Monitoring Sites
2
3
Kolan River
Burnett River
Bundaberg
9
1
7
4
10
8
Mundubbera
5
6
Gayndah
N
W
E
S
Kilometres
0
10
20
40

Streambank erosion baseline establishment project

Burnett & Kolan Rivers 2015

Appendix B

Field Method Statement

Queensland Government

1. Method for transect sampling

A. Set up transect alignment

1. Decide on number, location and alignment of transects.
2. Lay out tape measure from the top of the bank to the stream edge.
   - Note: Doing this first will enable surveyor to begin, whilst LROs conduct assessment. Tape measures may also be visible in photos, adding context.
3. Put flagged stake at top, bottom and segment divisions along transect.
   - Note: a change in segment can be based on a change in slope, vegetation, natural feature, or simply to break-up a long distance.
4. Surveyor to capture xyz coordinates of every stake along transect (these usually represent a segment boundary).
5. Surveyor to capture xyz coordinates of levels along transect for graphing of cross-section.

B. Establish photo monitoring points

6. Label blackboard (refer to section 3).
7. Determine location of permanent photo monitoring points & mark with short wooden stake (refer to section 2).
   - Note: Each transect should ideally have a minimum of 2 permanent photo points.
8. Surveyor to capture xyz of all permanent photo monitoring points.
9. Take photos and record photo number on *Site Data Collection Sheet*.
   - Note: Labelled blackboard should appear in all permanent photo monitoring points, and be placed 5 m from the photographer.

C. Pre-complete data sheets

10. Fill-out the *Site Data Collection Sheet* as much as possible.
11. Prepare a *Veg Data Collection Sheet* for each of the sites' transects.

D. Undertake veg assessment and photo capture along transects

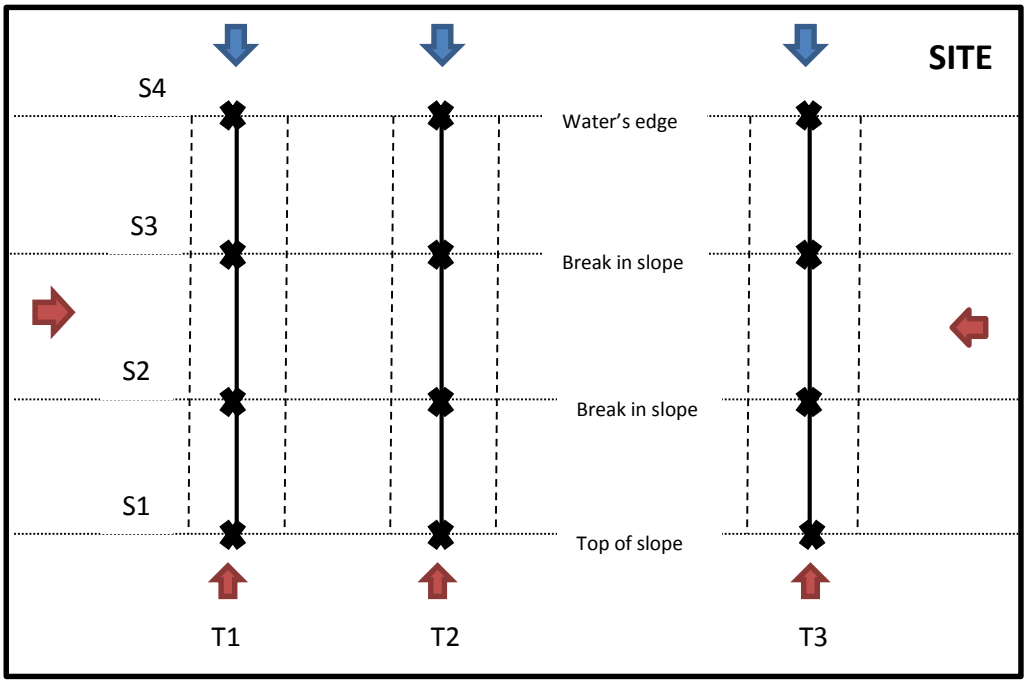
12. Assess one transect at a time, starting at the top of the transect and moving towards the river.
13. Survey vegetation 5 m either side of transect and record on *Veg Data Collection Sheet*
14. At each flagged stake, take photos facing and record photo number on sheet
    - Photos should be taken in sequence, the first always looking downslope (ie. towards river), and then in a clockwise direction at right-angles (ie. downslope, across, upslope, across other way).
    - Labelled blackboard is only required to appear in the first photo of the sequence of four (ie. looking down-slope) and should be placed 5 m away from the photographer; unless a break in slope does not allow.

E. Capture additional information

15. Ideally, record general slope of site using clinometer.
16. Ensure all photos have been taken (and number recorded), waypoints collected and all data collection sheets completed.
17. If slumping present, surveyor to capture points along top of slump at equal intervals.
18. Pack up equipment, removing stakes, blackboard, measuring tape, etc.

2. Photo Monitoring Points

Location of photo points will be site-specific (due to varying landform and characteristics); however the diagram below should be used as a guide. At a minimum, each transect should have two or more permanent photo monitoring points, in addition to "*N-S-E-W*" photos taken at points along transect. See labelling protocol (section 1) and method (section 1) for board placement rules.



Where: T = Transect & S = Segment

PHOTO LOCATIONS:

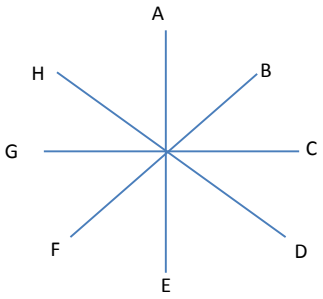
Symbol	Description	Blackboard	Marker	Frequency
✖	Four-photo-sequence taken at points along transect (usually at segment boundary), starting downslope towards the river (with the labelled board) then at right-angles in clockwise order.	Only at first of four. Place at 5 m from photographer. First photo to be taken at S1 facing the river.	Wooden stake. Record coordinates.	At baseline, then only at 5-yearly monitoring (or flood) events.
⬆	Permanent photo monitoring point. Single photo taken in direction of arrow.	Yes. Place at 5 m from photographer.	Wooden stake. Record coordinates.	At baseline, then at prescribed interval. Easy to find stake, avoid having to use GPS.
⬇	Permanent photo monitoring point. Single photo taken in direction of arrow.	Yes. Place at 5 m from photographer.	Wooden stake (optional). Record coordinates.	At baseline, then at prescribed interval. No stake, so will need to use GPS to relocate location.

3. Labelling Protocol for Blackboard & Photos

Label the blackboard as shown below:

Locality	Site No.	Subject	Transect	Segment*
Date				

*For non-segment photos (ie. photos of a whole transect or site) the board should be labelled according to the direction from which the photo was taken, in relation to the Transect, as per the compass shown (where A is the river and E is the top of the bank):



Where:

Locality	Site No.	Subject of photo	Transect	Segment
UB – Upper Burnett LB – Lower Burnett K – Kolan	1, 2, 3, …100	N – Native R – Reveg E – Earthworks ER – Earthworks & Reveg S – Overall site M – Miscellaneous	1, 2, 3, …10	1, 2, 3, …10 or A,B,C,D,E,F,G,H

Example:

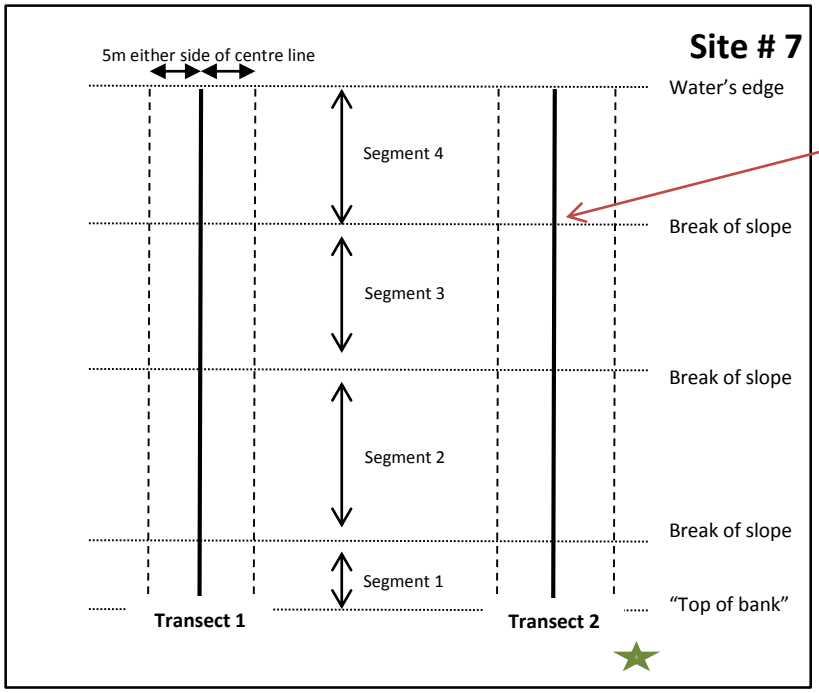


Photo point

- The blackboard for photos taken at the photo point indicated would look like this:

UB	7	R	2	4
1 May 2014				

- The sequence of four photos taken in a clockwise order at the boundary between segment 3 and segment 4 (ie. the *"N,E,S,W"* photos) would be labelled as follows:
  UB-7-R-2-4-**i**.jpg
  UB-7-R-2-4-**ii**.jpg
  UB-7-R-2-4-**iii**.jpg
  UB-7-R-2-4-**iv**.jpg

- An "overall site" photo taken from the green star ★ would be labelled as:
  UB-7-S-2-D.jpg

4. Equipment Checklist:

- Wooden stakes
- Flagging tape (pink)
- Mallet &/or sledge hammer
- Measuring tape (>100m) x2
- Camera
- Hand-held GPS
- Soil Kit
- Clinometer
- Site Data Collection Sheet
- Veg Data Collection Sheet
- Blackboard
- Chalk
- Duster
- Survey Equipment (eg. DGPS, laser level, measuring post, etc)
- Counter
- Densiometer (optional)
- Groundcover and canopy cover density charts
- Sledge hammer / post driver

Appendix 1

Site Data Collection Sheet

One sheet to be completed per site (ie. property).

SEME - Site Data Collection Sheet	
Site No:	**Landholder:**
Lot/Plan:	**Date:**
Locality:	**Completed By:**

Type of Works: (brief description of reveg / earthworks)

Site Characteristics			
Soil Type (ASC):		**Bank height:**	
SALI Site:		**Bank Slope:**	
Geology:		**Bank Length:**	
No Transects surveyed:		**Site length/width:**	
Vegetation Type:		**Est Flood Height:**	

Current Land Use:		**Erosion Description (type/cause/extent):**
Immediate site:		
Adjacent to site:		
Upstream:		

Site Significance / Reasons for Selection:	**Additional Notes:**

Transects:

(tick when photographed)

Segmt	T-1	T-2	T-3	T-4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Permanent Monitoring Photo Points:

(fill in labels for photos taken)

Locality	Site No	Subject	Transect	Segment	Date

Locality:
UB-Upper Burnett
LB – Lower Burnett
K – Kolan

Subject:
N – Native
R – Reveg
E - Earthworks
ER – Earthworks & Reveg
S – Overall Site
M – Misc.

Site sketch: (mark photo points, transects, significant features, distances, etc):

Appendix 2

Vegetation Data Collection Sheet

One sheet to be completed for each segment of each transect.

SEME - Vegetation Data Collection Sheet		
Site:	**Completed By:**	**Date:**
Transect No:	**Segment No:**	**Total No. of Segments:**
Length:	**Coords Start:**	**Coords End:**

Soil surface texture:	**Geology:**	**Slope:**
Landform Element:	**Landform Pattern:**	**Aspect:**

Notes / Diagram:

Vegetation Classes

Growth Form	Storey	Type	Status
T – Tree	**U** – Upper	**N** – Natural	**A** – Alive
S – Shrub	**M** – Mid	**P** – Planted	**S** - Sick
W – Woody weed	**G** - Ground		**D** - Dead
Wh – Non-woody weed			

Height	
5	>20
4	10.01-20.0
3	5.01-10.0
2	2.01-5.0
1	1.01-2.0
0	<1.0

Debris Description –

Describe quantity and type of material present; Eg. several scattered fallen logs; multiple dead trees caught up on lower bank; all debris removed; nil present; etc.

Groundcover

% Bare	% Litter	% Gravel	% Groundcover	Total
				100%
Debris Description:				

Standing vegetation count						**0**=<1, **1**=1-2, **2**= 2-5, **3**= 5-10, **4** = 10-20, **5** = >20	
Plant	**Growth Form**	**Storey**	**Type**	**Status**	**Height**	**Species**	
No.	T/S/W/Wh	U/M/G	N/P	A/S/D	0/1/2/3/4/5	*Genus species* or common name if known	**Tally**
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Appendix 3

Landholder Questionnaire

One sheet to be completed per site (ie. property), preferably at time of survey.

Land Use Questionnaire

Introductory notes to explain to landholder:

- Project description
- Project partners (BMRG, BCCA, DNRM)
- Explanation of riparian zone
- Privacy disclosure (no names to be used in report; however not exempt from RTI).
- Will be provided with copy of output.
- Landholder has agreed to host a permanent monitoring site – explain what this entails (e.g. photos/measurements will be taken, future monitoring events, etc.)
- Questions relate to: (i) flood impacts & (ii) historic, current and future land use and management practices.

Owner/Manager:	**Date**:
Property/Lot:	**Locality**:
Interviewee:	**River**:
Mobile:	**Email**:

General Questions:

1. How long have you owned/managed the property?

2. How many generations has your family owned/managed the property?

3. Do you own/manage the properties adjoining the monitoring site area?

4. What is the dominant land use on the farm (e.g. horticulture)?

Flood Questions:

4. What level did the flood waters reach (e.g. elevation in metres if known &/or landmark)?

5. What proportion of the farm was under water?

6. What impacts did the flood have on the farm?

Land Use Questions:

7. Please complete table:

Land Use	**Immediate site** (stretch of bank on which works are occurring)	**Adjacent site** (area immediately adjoining site)	**Wider catchment** (further upslope, may include on-farm, &/or on neighbouring farms)
Prior (before current)			
Current (at time of flood)			
Post-flood (now)			
Future			

Fencing Questions:

8. Please indicate yes/no:

• Prior to flood, monitoring site was fenced to exclude cattle:	
• Post flood, monitoring site is / will be fenced to exclude cattle:	
• Prior to flood, other sections of the riparian zone on the property were fenced to exclude cattle:	
• Post flood, other sections of the riparian zone on the property have been / will be fenced to exclude cattle:	

9. What is the frequency and rate at which the paddock closest to the site is stocked (if applicable)?
(e.g. 3 head cattle per hectare for six months of year, June to Dec)

10. If fenced, how long has the monitoring site area been fenced?

11. If fenced, are stock allowed into the monitoring site area for any period of time?

12. If stock are allowed into the monitoring site area, is the watering point off-stream?

13. Please indicate your primary reason for fencing the riparian zone (if appropriate):

Reason	Tick one
Prevent stock loss	
Prevent stock accessing neighbouring paddock	
Improve condition/health of waterway	
Prevent bank de-stabilising	
Improve biodiversity of riparian zone	
Recommended by BMRG remedial works plan	
Exclude feral animals:	
Other (please specify):	

14. What method/s of weed management (if any) do you use within the monitoring site area?

Reason	Tick applicable
Mechanical	
Hand removal	
Broad herbicide treatment	
Intensive grazing	
No treatment	
Other (please specify):	

Land Management Questions:

15. Please describe how and why you have changed your management practices since the flood, if applicable. (e.g. block layout, cultivation method/frequency, land use, increased riparian buffer zone, crop rotation, etc.).

16. What works have you undertaken to improve the condition of the streambank since the flood (i.e. aside from implementation of BMRG remediation plan)?

Works	Tick applicable	Description
Fencing remnant vegetation		
Fencing waterways		
Tree planting		
Groundcover planting		
Grazing modifications		
Fertiliser application		
Soil testing		
Earthworks		
Other (please specify)		

17. What works have you undertaken to improve the condition of the adjacent floodplain since the flood (i.e. aside from implementation of BMRG remediation plan)?

Works	Tick applicable	Description
Fencing remnant vegetation		
Fencing waterways		
Tree planting		
Groundcover planting		
Grazing modifications		
Fertiliser application		
Soil testing		
Earthworks		
Other (please specify)		

18. Please describe the planned maintenance regime for the monitoring site area.

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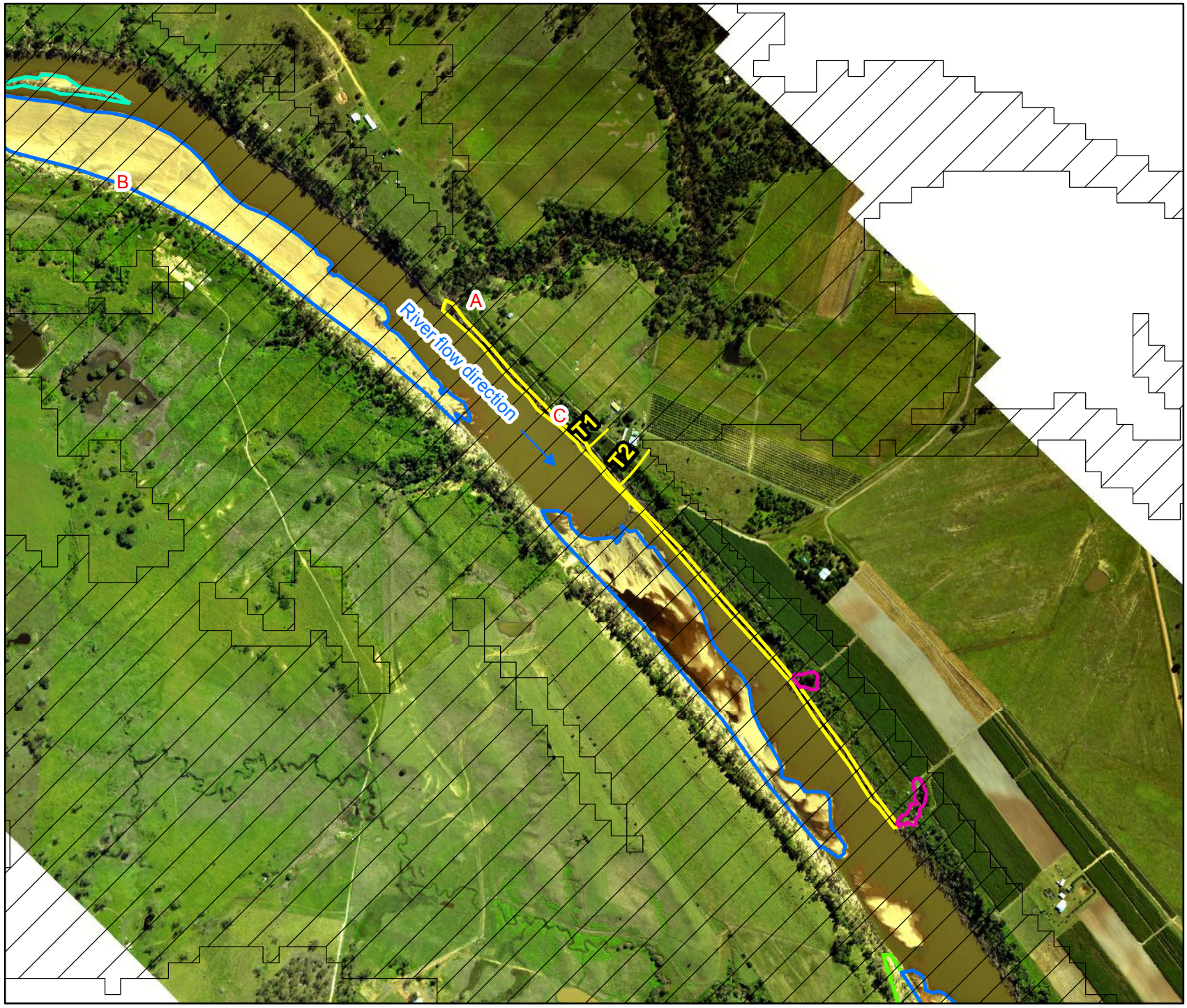
Appendix C

Maps showing site locations and erosional processes



FLOOD PROCESS AND IMPACT MAP

Site 1
Transect 1 & 2
Lower Burnett

Legend

- Transect
- Aproximate flood level

Flood

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

Map captions:
A. Outside bend of river
B. Inside bend of river
C. Steep lower bank and moderately steep upper bank

N
W E
S

Metres
0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.

FLOOD PROCESS AND IMPACT MAP

Site 2
Transect 1 & 2
Kolan River

Legend

Transect
Aproximate flood level

Flood

Impact_type

Floodplain sand deposition
Floodplain scouring
River bank scouring
River bank slumping
River bed sand deposition
River bed scouring

Map captions:
A. Outside bend of river
B. Inside bend of river
C. Meander plain
D. Direction of flood water

N
W E
S

Metres
0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.

FLOOD PROCESS AND IMPACT MAP

Site 3
Transect 1, 2 & 3
Kolan River

Legend

Transect

Approximate flood height

Flood

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

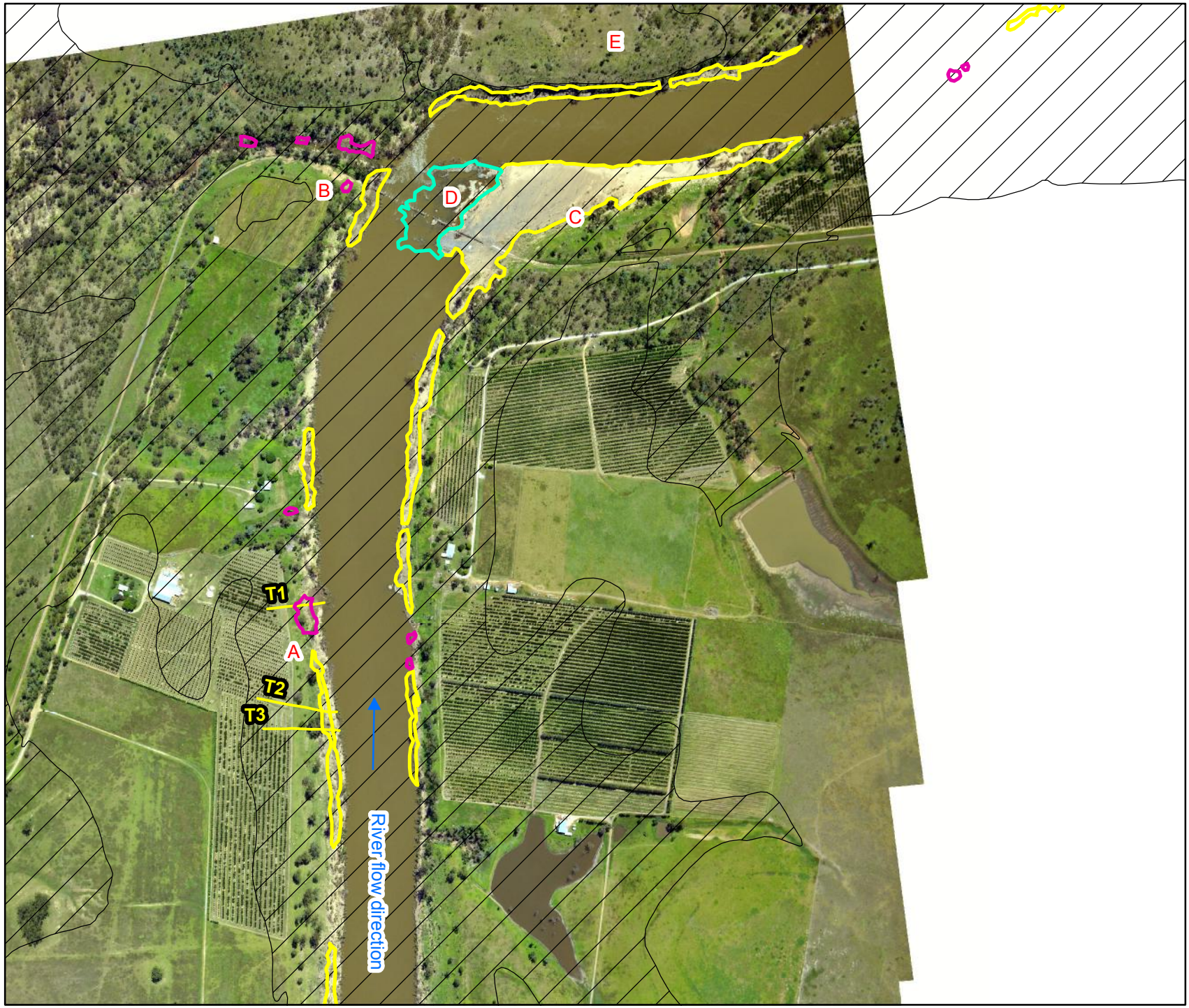
Map captions:
A. Outside bend of river
B. Inside bend of river
C. Direction of flood water

N
W E
S

Metres
0 250 500 750

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.



FLOOD PROCESS AND IMPACT MAP

Site 4
Transect 1, 2 & 3
Gayndah

Legend

- Transect
- Aproximate flood level

Flood

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

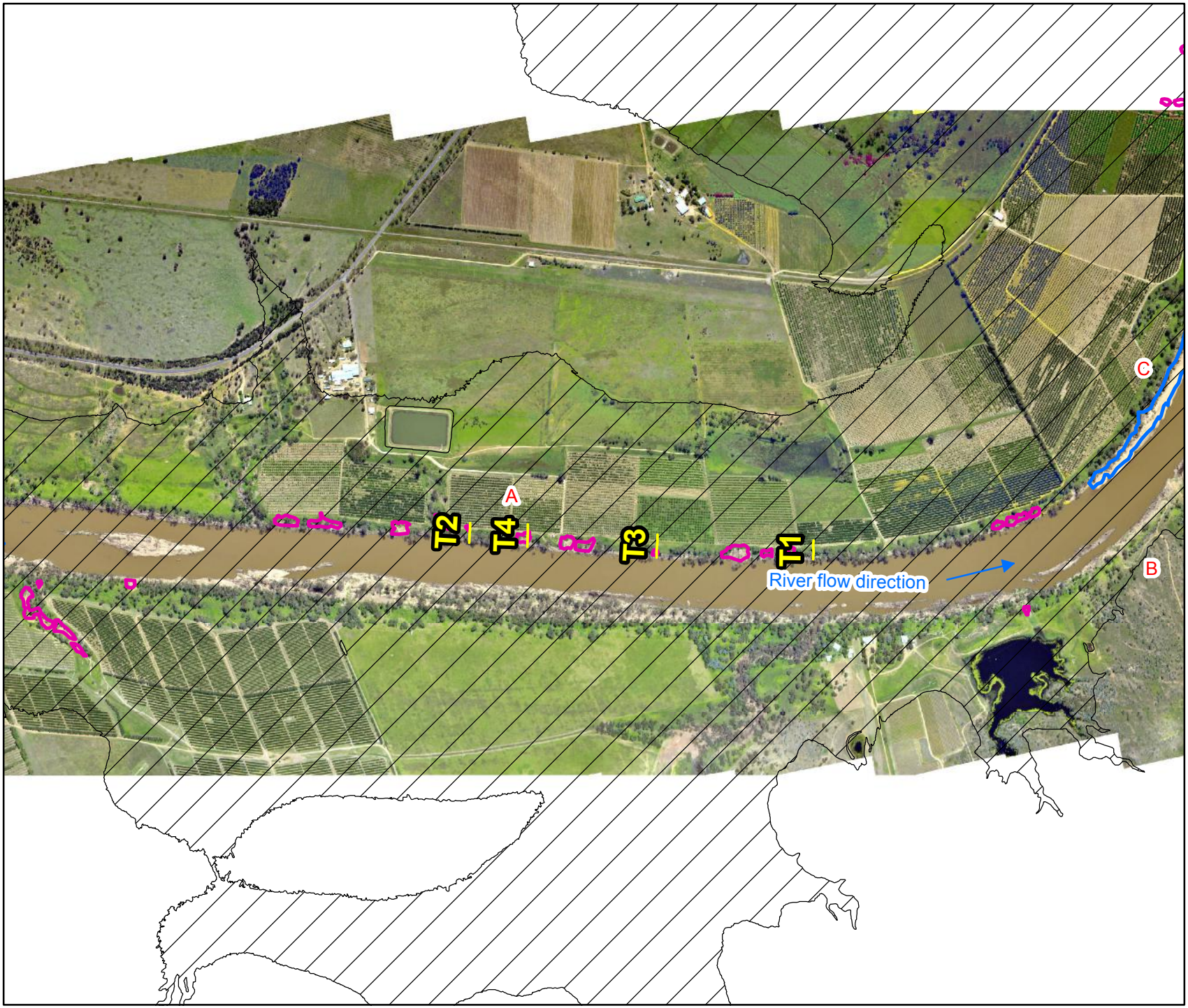
Map captions:
A. Straight stretch of river
B. Outside bend of river
C. Inside bend of river
D. Rock bar
E. Hard rock geology

N
W E
S

Metres
0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.



FLOOD PROCESS AND IMPACT MAP

Site 5
Transect 1, 2, 3 & 4
Mundubbera

Legend

- Transect
- Aproximate flood level

Flood

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

Map captions:

A. Straight stretch of river with high banks
B. Hard rock geology
C. Inside bend of river

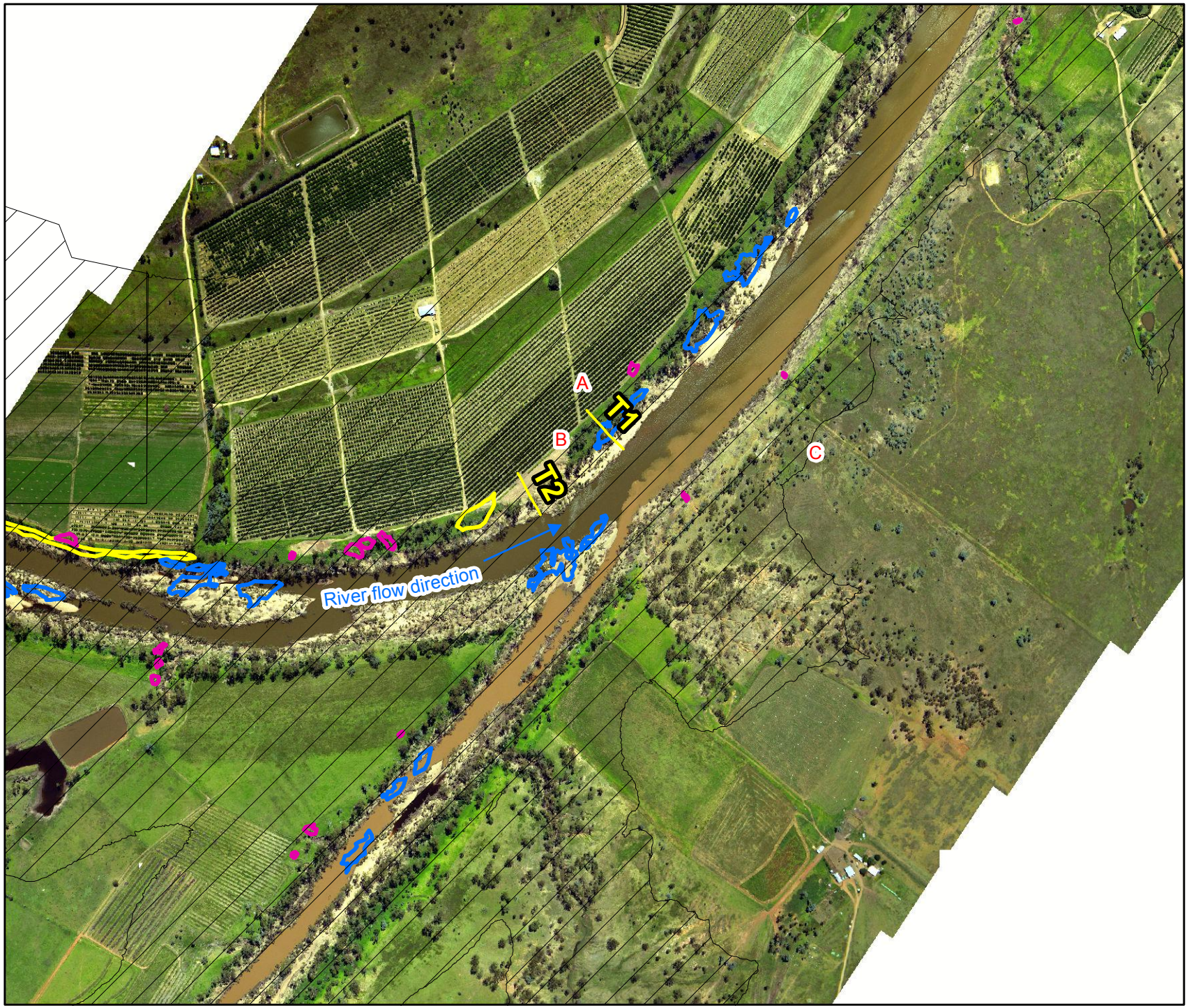
N
W E
S

Metres

0 250 500 750

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.



FLOOD PROCESS AND IMPACT MAP

Site 6
Transect 1 & 2
Mundubbera

Legend

- Transect
- Aproximate flood level

Impacted Areas North Burnett

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

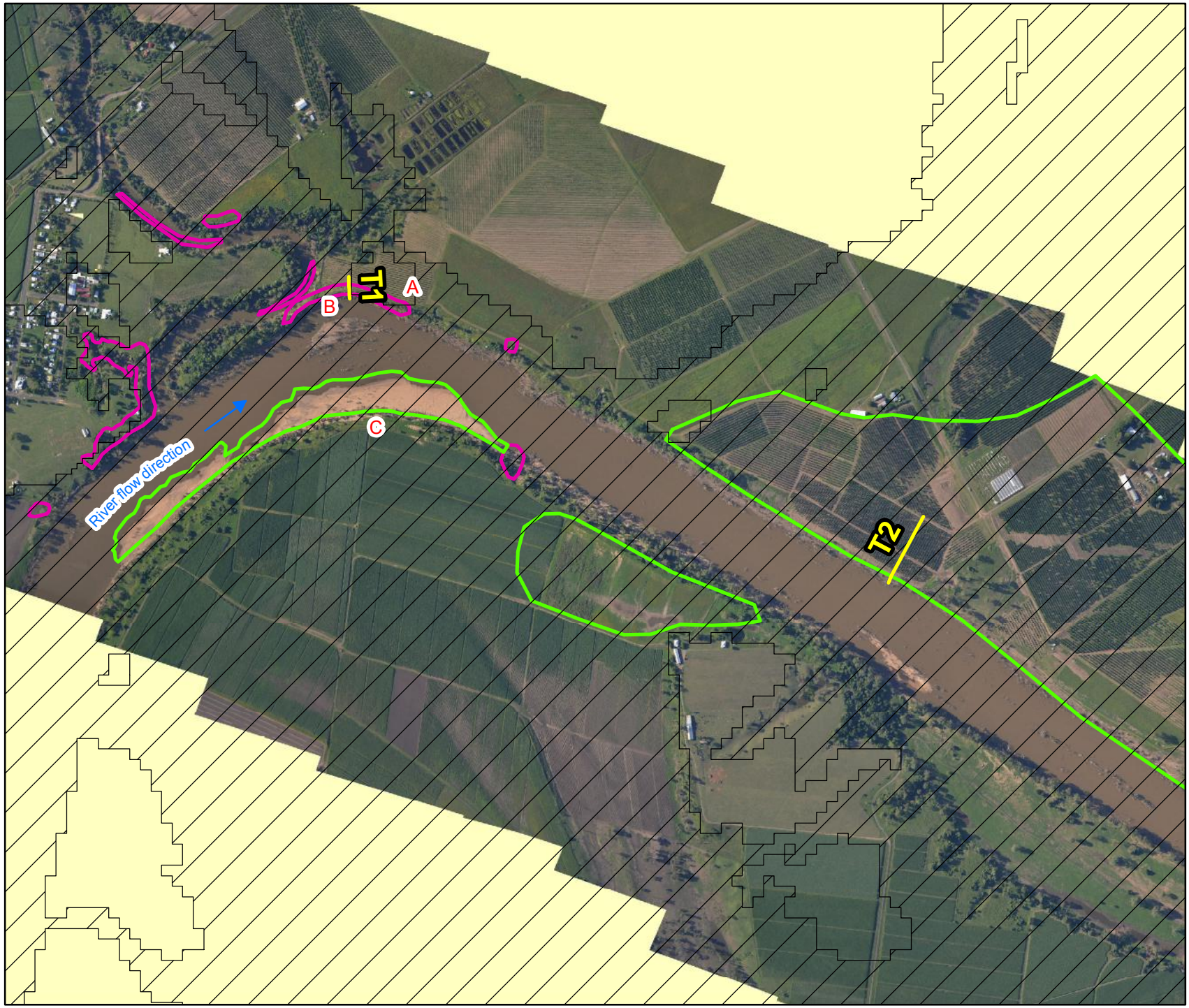
Map captions:
A. Inside bend of river
B. Steep, high bank
C. Hard rock outisde bend of river

N
W E
S

Metres
0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.



FLOOD PROCESS AND IMPACT MAP

Site 7
Transect 1 & 2
Lower Burnett

Legend

- Transect
- Aproximate flood level

Flood

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

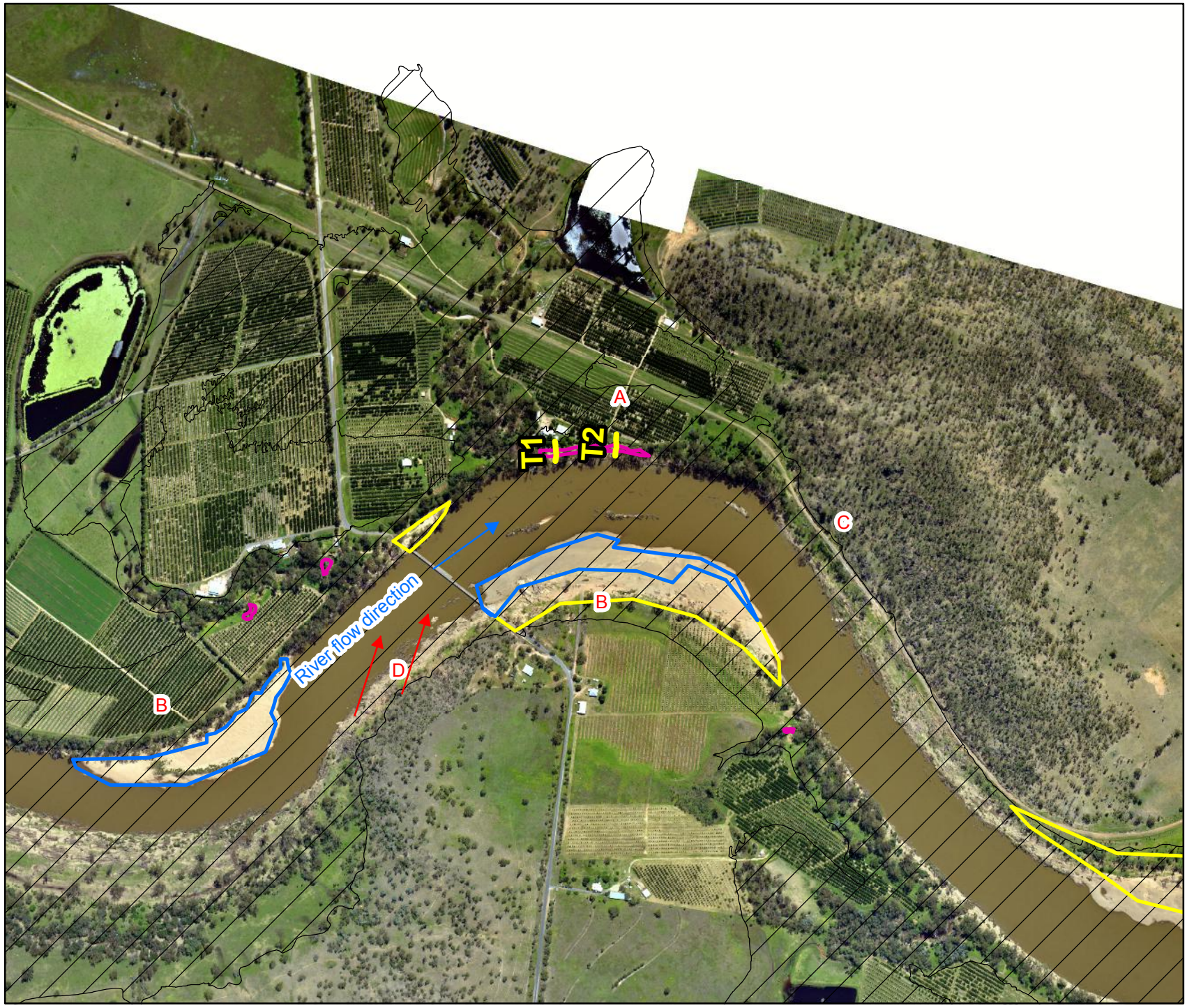
Map captions:
A. Outside bend of river
B. Steep, high banks
C. Inside bend of river

N
W E
S

Metres
0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.



FLOOD PROCESS AND IMPACT MAP

Site 8
Transect 1 & 2
Gayndah

Legend

- Transect
- Aproximate flood level

Flood

Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

Map captions:

A. Outside bend of river
B. Inside bend of river
C. Hard rock geology
D. Hard rock on southern bank deflecting water to northern bank of river

N
W E
S

Metres

0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.

FLOOD PROCESS AND IMPACT MAP

Site 9
Transect 1
Lower Burnett

Legend

Transect
ApproximateFlood level

Flood
Impact_type

Floodplain sand deposition
Floodplain scouring
River bank scouring
River bank slumping
River bed sand deposition
River bed scouring

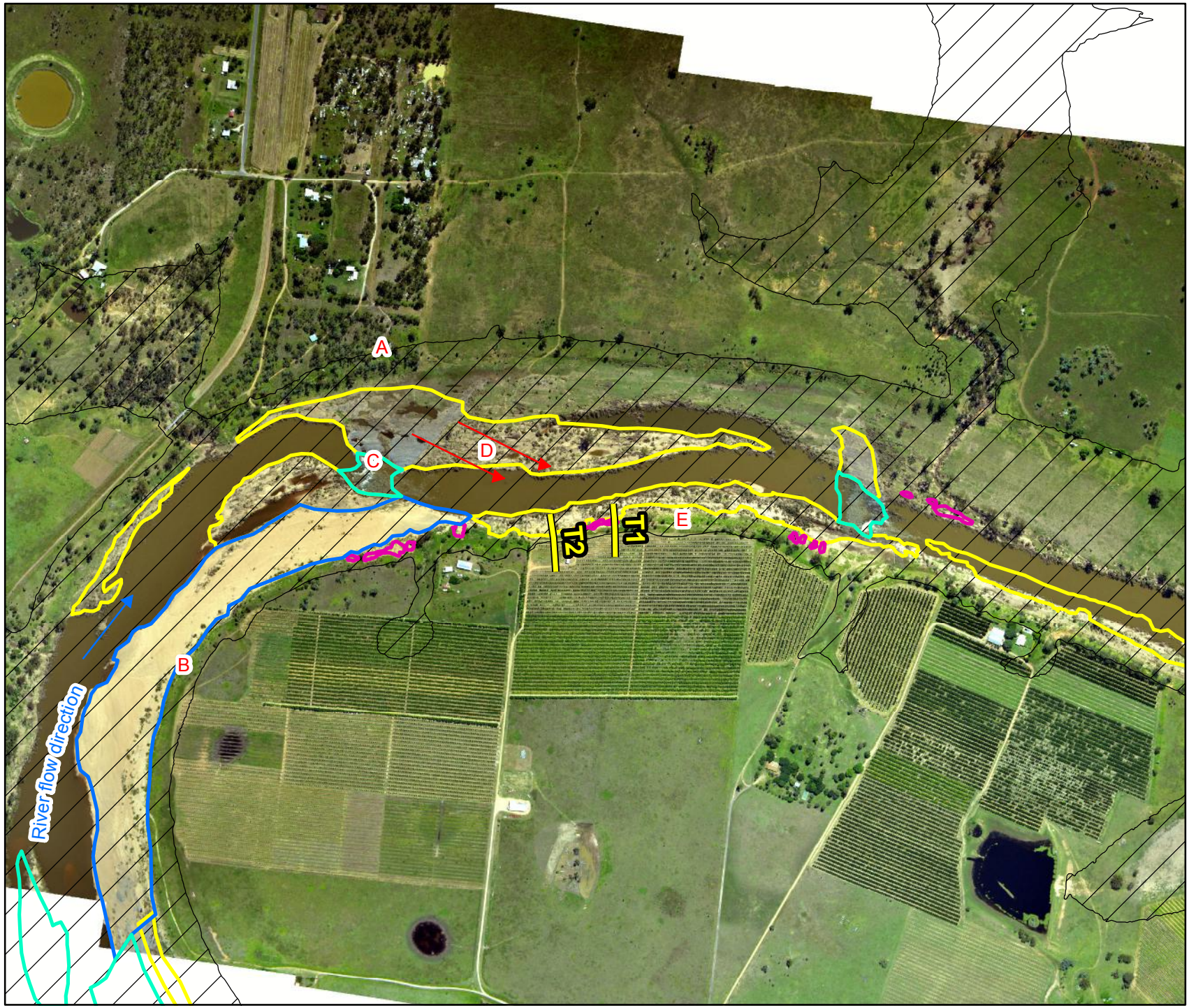
Map captions:
A. Steep, high banks of off-stream gully

N
W E
S

Metres
0 100 200

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.



FLOOD PROCESS AND IMPACT MAP

Site 10
Transect 1 & 2
Gayndah

Legend

- Transect
- Aproximate flood level

Flood
Impact_type

- Floodplain sand deposition
- Floodplain scouring
- River bank scouring
- River bank slumping
- River bed sand deposition
- River bed scouring

Map captions:

A. Outside bend with hard rock geology
B. Inside bend of river
C. Rock bar
D. Hard rock on northern bank deflecting water to southern bank of river
E. Steep high bank

N
W E
S

Metres
0 250 500

Coordinate System:
GDA 94 Zone 56

This map has been prepared as part of the Burnett/Kolan River Streambank Erosion Monitoring Project using flood recovery datasets - 2015.